

(19) World Intellectual Property Organization
International Bureau



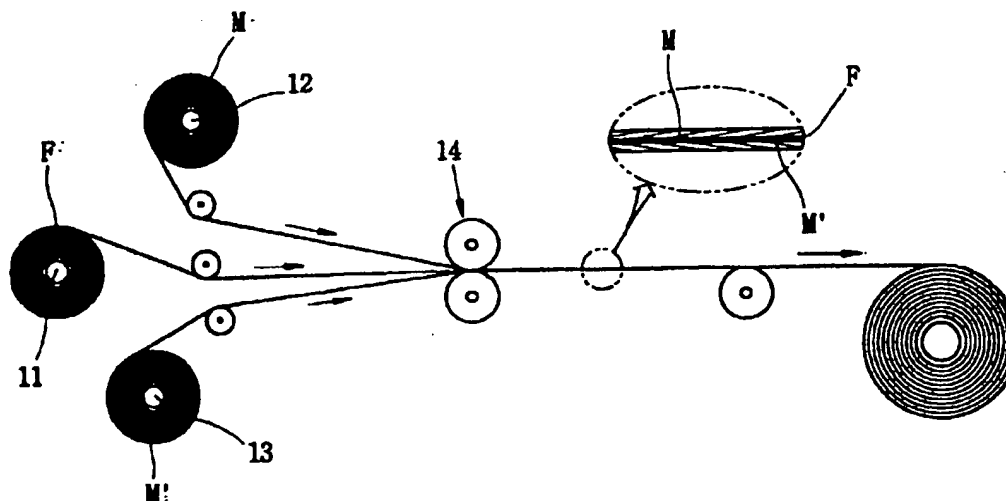
(43) International Publication Date
10 May 2002 (10.05.2002)

PCT

(10) International Publication Number
WO 02/36703 A1

- (51) International Patent Classification⁷: C09J 7/02 APT, 669-2, Umgoong-Dong, Sasang-Gu, 617-030 Busan (KR).
- (21) International Application Number: PCT/KR01/01834
- (22) International Filing Date: 30 October 2001 (30.10.2001)
- (25) Filing Language: Korean
- (26) Publication Language: English
- (30) Priority Data:
2000/0064038 30 October 2000 (30.10.2000) KR
- (71) Applicant: EVEX CO., LTD. [KR/KR]; 511, Youlam-Li, Paltan-Myun, Hwasung-Kun, 445-913 Kyungki-Do (KR).
- (72) Inventors: BEYUN, Jun-Hee; 102-2101, Umgoong-taelim APT, 669-2, Umgoong-Dong, Sasang-Gu, 617-030 Busan (KR). SONG, Jung-Suk; 102-2101, Umgoong-taelim
- (74) Agent: KIM, Young-Hwan; 5th Fl, Chogwang Bldg, 1572-15, Seocho-Dong, Seocho-Gu, 137-874 Seoul (KR).
- (81) Designated States (*national*): CN, DE, ID, IN, JP, VN.
- (84) Designated States (*regional*): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).
- Published:
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: HOT MELT ADHESIVE FILM PARTIALLY COMPRISING AN EVA RESIN



(57) Abstract: A hot melt adhesive film, on the surface of which a wax emulsion is deposited, ranging from 20 to 100µm in thickness and comprising 60 to 85 wt% of EVA resin containing 20 to 46 wt% of vinyl acetate, and 15 to 40 wt% of C₅ to C₉ hydrocarbon resins with a softening temperature of 80 to 130°C. The hot melt adhesive film is advantageous in that equipment for its production is simple, a productivity and a working environment are improved because the wax emulsion layer formed on a surface of the hot melt adhesive film acts as a release agent between films so that it is possible to form, store and use the hot melt adhesive film without a further release agent.

HOT MELT ADHESIVE FILM PARTIALLY COMPRISING AN EVA RESIN

BACKGROUND OF THE INVENTION

5 1. Field of the invention

 The present invention relates, in general, to EVA resin-based hot melt adhesive films in particular, to hot melt adhesive films formed by mixing the melted EVA resin with melted aliphatic and aromatic hydrocarbon resins for
10 endowing hot melt adhesive films with an adhesion force, on the surface of which a wax emulsion is deposited. Hot melt adhesive films are maintained in a solid form having a low adhesion force, and so it is easy to roll the adhesive film and store the adhesive film without a further release of the
15 substance, but when required for use, the adhesion force of hot melt adhesive films is increased by melting the film by application of heat thereto.

2. Description of the Prior Art

20 Based on thermoplastic resins, hot melt adhesives have advantages in stability, working condition, and economy of energy use over conventional solvent-type adhesives, thereby rapidly expanding their applications. According to base resins, hot melt adhesives are classified into five

categories: polyethylene, polyamide, polyester, acryl, and reactive-type.

Polyethylene-based adhesives are usually exemplified by PE, EVE, and EEA, of which EVE is predominantly used. Applied for the bonding of metals, woods, ceramics and plastics, polyamide-based adhesives show strong adhesive forces and excellent heat resistance. With excellent durability, polyester-based adhesives can be applied to various adherends, including automotive parts, electric parts, and food packing materials. Acryl-based adhesives exhibit various physical properties, and ethylene/acrylic acid ethylene copolymers are found in the bonding of adherends such as nylon, polypropylene, etc. Improved in heat resistance, reactive-type adhesives, once solidified, do not go back into a molten phase by means of an irreversible reaction, unlike general hot melt adhesives.

Also, hot melt adhesives may be classified into a solution-type, and a block and chip-type according to their forms. A solution-type hot melt adhesive, which is produced by dissolving a hot melt composition in an organic solvent, easily forms into liquid-type adhesives and is convenient for working. However, the liquid-type adhesive is limitedly used because of its high price and the toxicity of the organic solvent.

Block and chip-type hot melt adhesives, produced by

molding hot melt compositions to blocks or small chips, must be melted before application for the bonding of two adherends. In detail, a block and chip-type hot melt adhesive is melted by heating in a melter, and the melted
5 hot melt adhesive is coated on at least one side of an adherend, against which another adherend is pressed by use of a press to give a laminate structure. Therefore, block and chip-type hot melt adhesives suffer from the disadvantage of requiring complicated apparatuses such as a
10 melter, consuming a large quantity of energy for preheating the melter, and being not uniform in coating thickness throughout the surface of the adherend.

To overcome the above-mentioned drawbacks, research has been directed into the development of hot melt adhesives
15 in the shape of films. However, hot melt adhesive compositions comprising EVA resin, which itself is somewhat adhesive, plus hydrocarbon resin for improving adhesion force, are difficult to mold into films. Also, the films, even if molded, are difficult to store.

20 In addition, conventional hot melt adhesive films should be provided with release paper or films lest the hot melt adhesive films stick to themselves when rolled for storage. Hence, the use of release paper or films requires complicated winders, which increases the price, and leaves
25 the disposal problem of the release paper or films.

SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to
5 provide hot melt adhesive films which, in solid form, have
an adhesion force sufficiently low for storage and, in
molten form, have an adhesion force sufficiently large to
bond adherends.

Based on the present invention, the above object could
10 be accomplished by a provision of an EVA resin-based hot
melt adhesive film, comprising 60 to 85 wt% of EVA resin
containing 20 to 46 wt% of vinyl acetate, and 15 to 40 wt%
of C5 to C9 hydrocarbon resin with a softening temperature
of 80 to 130°C, on the surface of which a wax emulsion is
15 deposited.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other
20 advantages of the present invention will be more clearly
understood from the following detailed description taken in
conjunction with the accompanying drawings, in which:

Fig. 1 schematically illustrates an apparatus for
adhering adherends to each other with the use of hot melt
25 adhesive films of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In the present invention, the hot melt adhesive film
5 which can be stored in a roll form without any release paper
or films, is formed by molding a mixture of an EVA resin and
a hydrocarbon resin into a film and spray-coating a high wax
emulsion onto the film.

Hot melt adhesive films of the present invention
10 comprise 60 to 85 wt% of the EVA resin as a base polymer and
correspondingly 15 to 40 wt% of an aliphatic and aromatic
hydrocarbon resin for increasing the adhesion force. In
accordance with the present invention, the EVA resin contains
20 to 46 wt% of vinyl acetate, and the hydrocarbon resin
15 ranges, in softening temperature, from 80 to 130°C.

For example, when the hydrocarbon resin content is less
than 15 wt%, it is easy to form the EVA-hydrocarbon resin
mixture into a film, but sufficient adhesion force cannot be
obtained in the hot melt adhesive film. On the other hand,
20 when the content is more than 40 wt%, the adhesion force is
greatly increased, but it is difficult to form the resulting
EVA-hydrocarbon resin mixture to a film. Also, the film,
even if molded, is difficult to store in a roll form because
the wound film adheres to itself owing to the increased
25 adhesion force.

Meanwhile, when the EVA resin contains vinyl acetate in an amount of less than 20 wt%, the resulting EVA-hydrocarbon mixture can be easily formed films, but not into ones having sufficient adhesive force. On the other hand, when the vinyl acetate content is more than 46 wt%, the adhesion force is sufficiently increased, but not only is the film-forming difficult, but also the production cost of the hot melt adhesive film increases.

Two types of the hydrocarbon resins, C5 or C9 hydrocarbon resins, may be used. The hydrocarbon resins are used for increasing the adhesion force of the adhesive film, and may be further hydrogenated in order to remove its intrinsic yellow color of the resins and to prevent the resins from yellowing.

The adhesive film of the present invention is formed by molding a mixture of an EVA resin and a C5 to C9 hydrocarbon resin into a film and spraying a high wax emulsion onto the film. Serving as a releasing agent, the high wax temporarily reduces the adhesion force of the hot melt adhesive film, so that it is possible to form, wind and store the hot melt adhesive film without additional release substances.

Existing as an aqueous solution, the high wax emulsion is deprived of water by the heat of the adhesive film when sprayed over the adhesive film, while only the wax component remains on the surface of the adhesive film. Upon the

melting of the adhesive film, the remaining wax is also melted and thus mixed with the adhesive film resins. As the wax is uncovered, the hot melt adhesive film can recover its intrinsic adhesion force

5 Hot melt adhesive films of the invention preferably range from 20 to 100 μm in thickness. For $\square\square\text{m}$ in thickness. thickness is less than 20 μm , it is difficult to for $\square\square\text{m}$, i store the adhesive film, and the amount of the adhesive film is too small to display a sufficient adhesion force. On the
10 other hand, when the thickness is more than 100 μm , it is easy to form the adhesive film, but the hot melt adhesive film becomes expensive and is unpleasant to the touch, on final products to be applied therewith.

A better understanding of the present invention may be
15 obtained in light of the following examples which are set forth to illustrate, but are not to be construed to limit the present invention.

Referring to Fig. 1, a hot melt adhesive film F is unwound from a reel 11 and fed between adherend films M and
20 M', which are unwound at the same rate as the hot melt adhesive film F from reels 12 and 13, respectively, to form a multilayer film structure in which the adherends M and M' are stuck to either side of the hot melt adhesive film F. In this regard, the unwound hot melt adhesive film and
25 adherend films are allowed to pass through a hot pressure

roll 14 heated at a proper temperature to melt the hot melt adhesive film, thereby bonding the adherend films to each other via the hot melt adhesive film. Cooling is conducted before the integrated film is wound round a take-in roller.

- 5 Likewise, a triple film structure can be obtained by allowing the bi-ply film structure to pass through the hot pressure roll, along with a hot melt adhesive film and an adherend film. Alternatively, three adherend films and two adhesive films may be allowed to pass through the hot
10 pressure roll at the same time in the above procedure.

Components of the hot melt adhesive films of the present invention used in examples and comparative examples are described in Table 1, below.

15

TABLE 1

		Examples						Comp. Exam.			
		1	2	3	4	5	6	1	2 ³	3	4
¹ VA content (wt%)		20	28	28	32	40	32	28	41 (28)	15	46
² EVA content (wt%)		65	65	75	75	70	80	58	60 (20)	86	86
H. C.	Softening Temp. (°C)	90	110	130	120	120	100	90	120	100	110
resin	Content (wt%)	35	35	25	25	30	20	42	20	14	14
⁴ Adhesive film Thick. (mm)		50	30	30	50	40	30	X	30	30	30

¹ VA contained in EVA, based on 100 parts by weight of EVA.

² based on 100 parts by weight of EVA + H. C. resin

³ 60 wt% of EVA with a VA content of 41 wt% mixed with 20 wt% of EVA with a VA content of 28 wt%.

⁴ coated with a wax emulsion

5 As shown in Table 1, in comparative example 1, the hot melt adhesive film could not be produced because the hydrocarbon resin for increasing the adhesion force of hot melt adhesive films was added in an amount exceeding the upper limit of the preferable range to cause an excessive
10 increase in the adhesion force of the hot melt adhesive film.

 In comparative example 2, components for a hot melt adhesive film were used with preferable amounts within the proper range to form the hot melt adhesive film, but the film stuck to itself when rolled for storage because the
15 film was not treated with an emulsion wax. In comparative examples 3 and 4, the hot melt adhesive films were treated with the same emulsion wax as in examples 1 to 6, but components of the hot melt adhesive films deviated from the preferable ranges.

20 An adhesion test was conducted, in which the hot melt adhesive films in examples 1 to 6 and comparative examples 3 and 4 are adhered to various adherends. The results are given in Table 2, below.

TABLE 2

Layered structure of adherends	Examples						Comp. Exam.	
	1	2	3	4	5	6	3	4
MD lylex + 4mm PU form + tricot	O	O	O	O	O	O	X	X
RM + 4mm PU form + tricot	O	O	O	O	O	O	X	X
UT mesh + 6mm PU form + tricot	O	O	O	O	O	O	X	X
YS mesh + 4mm PU form + tricot	O	O	O	O	O	O	X	X
A lusido mesh + 6mm PU form + tricot	O	O	O	O	O	O	X	X
Roaster mesh + 4mm PU form + tricot	O	O	O	O	O	O	X	X
Insia mesh + tricot + 4mm PU form + tricot	O	O	O	O	O	O	X	X
Tietex + 4mm HD PU form	O	O	O	O	O	△	X	X
MD lylex+4mm EVA form	O	O	O	O	O	△	X	X
Heavy merry mesh + 4mm EVA form	O	O	O	O	O	O	X	X
Dynassy 2000 + 6mm PU form + 0.45mm non woven fabric	O	O	O	O	O	O	X	X
* O: good, △: medium, X: bad								

From the results shown in Table 2, it can be seen that the adhesion force is slightly reduced according to
5 adherends because an amount of hydrocarbon resin, which is added to increase the adhesion force into the hot melt adhesive films, is approximate to the lower limit of the

preferred range, in the case of example 6. As for comparative examples 3 and 4, it is possible to wind and store the adhesive film by depositing a wax emulsion onto the adhesive film, but the amount of hydrocarbon resins is too small to display sufficient adhesion force.

It can be confirmed from the above adhesion test which components of hot melt adhesive films are at an optimum amount, or not. In comparison with the adhesive film of the present invention, rubber-based 7430L-2 gives off a bad smell, requires a long time for drying, and provides an inferior adhesion force when the 7430L-2 is used with a solvent for adhering an insole to shoes.

As described above, hot melt adhesive films are advantageous in that equipment for production is simple, productivity and working condition are improved because the wax emulsion layer formed on a surface of hot melt adhesive films acts as a release substance between films, so that it is possible to form, store and use the hot melt adhesive films without a further release substances. Moreover, other advantages of the invention are that the adhesive film of the present invention has a superior adhesion force to 7430L-2, that so productivity is increased, i.e. the number of shoe insoles can be adhered, per 1 g of hot melt adhesive films is increased, decreasing costs.

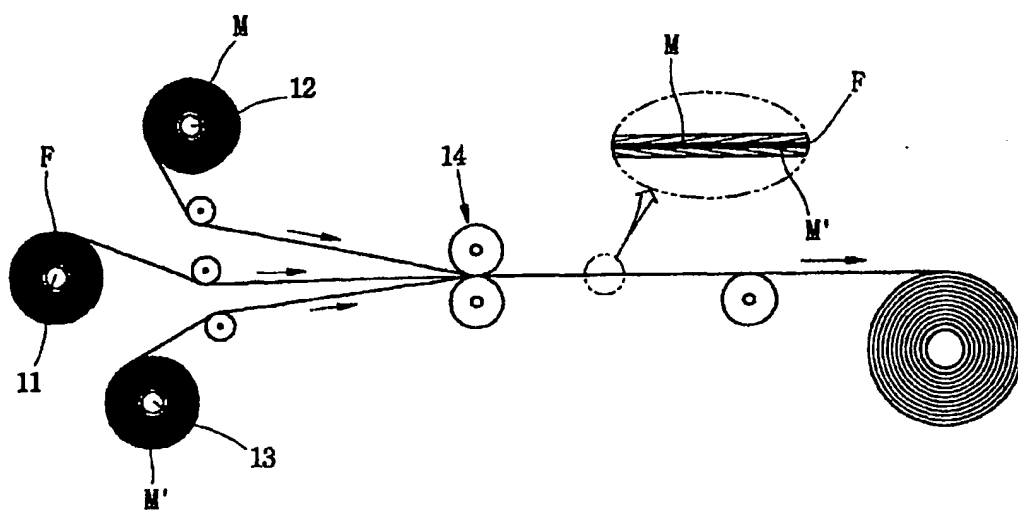
The present invention has been described in an illustrative manner, and it is to be understood that the terminology used is intended to be in the nature of description rather than of limitation. Many modifications and variations of the present invention are possible in light of the above teachings. Therefore, it is to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An EVA resin-based hot melt adhesive film,
comprising 60 to 85 wt% of EVA resin containing 20 to 46 wt%
5 of vinyl acetate, and 15 to 40 wt% of C5 to C9 hydrocarbon
resin with a softening temperature of 80 to 130°C, on the
surface of which a wax emulsion is deposited.
2. The EVA resin-based hot melt adhesive film as
10 defined in claim 1 ranging from 20 to 100µm in thickness.

1/1

Fig. 1



INTERNATIONAL SEARCH REPORT

 International application No.
PCT/KR01/01834

A. CLASSIFICATION OF SUBJECT MATTER IPC7 C09J 7/02 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC7 A61K 6/10, C08L 91/06, C09J 11/06, 123/08, 191/06 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) NPS, WIPS, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 05-320021 A (GC CO.,LTD) 3 DECEMBER 1993 See the whole document	1
Y	JP 57-158276 A (SEKISUI CHEM CO., LTD) 30 SEPTEMBER 1982 See patent abstract and claims	1
A	US 6106939 A (HERCULES INC) 22 AUGUST 2000 See the whole document	1
A	JP 07-247468 A (DAICEL CHEM IND LTD) 26 SEPTEMBER 1995 See the whole document	1
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 19 FEBRUARY 2002 (19.02.2002)		Date of mailing of the international search report 20 FEBRUARY 2002 (20.02.2002)
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 920 Dunsan-dong, Seo-gu, Daejeon Metropolitan City 302-701, Republic of Korea Facsimile No. 82-42-472-7140		Authorized officer KIM, Seung Soo Telephone No. 82-42-481-5581

